
Introduction

In April 1997, the National Aviation Weather Program Council (NAW/PC) approved and published a *National Aviation Weather Program Strategic Plan*, which had been developed by the council's Joint Action Group for Aviation Weather. This strategic plan was the first step in a federal agency response to the challenge for improved aviation weather safety set forth in a National Research Council report, *Aviation Weather Services—A Call for Federal Leadership and Action* (NRC 1995). The Federal Coordinator, who serves as Chair of the NAW/PC, has coordinated the activities to support and implement the strategic plan. These activities draw on the resources of the Joint Action Group for Aviation Weather and the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM).

In February 1997, the White House Commission on Aviation Safety and Security recommended a national goal for government and industry of reducing the rate of fatal aviation accidents by a factor of five (an 80 percent reduction) within ten years. Safety research and technology improvements were recognized as essential elements in achieving this goal. Subsequently, both the Federal Aviation Administration (FAA), as the lead federal agency for aviation weather safety, and the National Aeronautics and Space Administration (NASA) adopted the 80 percent reduction goal in their strategic plans.

The next major step toward coordinating the many federal and nonfederal programs relevant to improving aviation weather safety was another report prepared by the Joint Action Group for Aviation Weather, *National Aviation Weather Initiatives*. It was approved by the NAW/PC and released in February 1999. Besides identifying ongoing and planned initiatives, this report discussed the 80 percent reduction goal and suggested that a reduction in weather-related accidents, as shown by National Transportation Safety Board (NTSB) accident statistics,

could be used as an overall measure of success for the portfolio of aviation weather initiatives (OFCM 1999).

In the 1997 strategic plan, the NAW/PC took responsibility for overseeing periodic reviews of the program to provide mid-course corrections as needed, as well as to maintain momentum as the plan progressed. The OFCM was assigned a supporting role in providing analyses, summaries, and evaluations as “a factual basis for the executive and legislative branches to make appropriate deci-

This mid-course assessment is a periodic review required under the 1997 *National Aviation Weather Program Strategic Plan*.

sions related to the allocation of funds” (OFCM 1997, pp. 3, 25). The plan is now halfway to the fiscal year (FY) 2007 marker set for achieving an 80 percent reduction in fatal accidents, an appropriate time to review progress and consider any needed mid-course corrections.

Beginning with 1996 as the starting point for accident reduction, five years of accident data are now available from the NTSB. These data can be analyzed to determine how much progress has been made toward reducing weather-related accident rates. Throughout this report, *an 80 percent reduction in accidents from the level circa 1996 is used as the benchmark*. This benchmark is used to assess progress and seek areas where more effort, or a redirection of effort, may be worthwhile. This assessment approach amounts to “distributing” the goal of a fivefold reduction in fatal accidents across the three principal regulatory categories for aircraft and across categories for weather-related aviation hazards. Needless to say, the overall national goal can be met without achieving an 80 percent reduction in each category used for analysis. (It may even be preferable, for various reasons,

to seek greater reductions in some areas than others.) Still, a consistent yardstick for success provides a convenient and useful starting point for assessing progress and considering mid-course corrective actions.

The remainder of this introduction sets the context for the strategy used in this mid-course assessment and specifies the key assumptions made in the data analysis. Section 2 applies the strategy and assumptions to an analysis of aviation accidents by aircraft regulatory category for the period 1996 through 2001.¹ It provides an overview of total aviation accidents, fatal accidents, and weather-related accidents (total and fatal) for each aircraft category.

Section 3 extends the analysis by differentiating among specific types of weather hazards. This analysis sets the stage for the portfolio analysis in Section 4, which examines how the portfolio of aviation weather programs and initiatives is performing relative to the 2007 goals.

Early in 2001, the OFCM completed a comprehensive analysis of programs and projects that had been identified as meeting the needs and concerns compiled in the *National Aviation Weather Initiatives* report. Programs led by or involving participation of federal agencies, industry, universities, and associations were included. The results of this analysis were presented in the first release (April 2001) of the *National Aviation Weather Initiatives Final Baseline Tier 3/4 Report* (OFCM 2001).² A critical source of information for that report was an Aviation Weather User Forum held in July 2000 (OFCM 2000). Since the baseline release, the Tier 3/4 report has become a living document, with ongoing additions of new programs and updates on the status of programs in progress. Section 4 draws on the Tier 3/4 status reviews to provide an overview of all aviation weather programs and to discuss the relevance of specific programs to the results of the hazard analysis. It concludes with highlights of past, current, and future implementations that continue to improve aviation weather safety.

¹Preliminary 2002 data for some data series were available from the NTSB but were not considered complete enough to include in the analyses in Section 2. Footnotes in Section 2 discuss the effect the 2002 data would have on the trends as presented.

²The *National Aviation Weather Program Strategic Plan* (OFCM 1997) constitutes Tier 1. The initiatives set forth in *National Aviation Weather Initiatives* (OFCM 1999) constitute Tier 2.

FAA Accident Reduction Goal and Objectives

Since adopting the 80 percent reduction goal established in the 1998 Safer Skies initiative, the FAA has maintained the following Safety Mission Goal (FAA 2001a, p. 11).

By 2007, reduce U.S. aviation fatal accident rates by 80 percent from 1996 levels.

Under this broad goal are four more-specific objectives (FAA 2001a, pp. 11–12):

- ▶ **Fatal Carrier Accident Rate:** By FY 2007, reduce the U.S. commercial air carrier fatal accident rate per 100,000 departures by 80 percent of the 3-year average from FY 1994 to 1996.
- ▶ **General Aviation Fatal Accidents:** Reduce general aviation fatal accidents by an amount that will result in a 20 percent improvement of the projected 2007 estimate of 437 (or no more than 350 a year).
- ▶ **Overall Aircraft Accident Rate:** Reduce the rate per 100,000 flight-hours.
- ▶ **Increase Survivability:** Increase the probability that passengers and crew will survive an air carrier flight.

The FAA assesses year-by-year progress toward these objectives using NTSB accident data, other data sources, and interpretive assumptions.

Although the OFCM mid-course assessment of aviation weather progress is generally consistent with the FAA Safety Mission Goal, the analysis diverges in some details—primarily for technical reasons explained below—from interpretations used by the FAA to chart its progress toward its first three objectives. The first step in presenting these differences is to introduce the shared source of accident data, the NTSB database on aviation accidents.

NTSB Aviation Accident Database

The NTSB uses categories for commercial air carriers and general aviation defined by three parts of the Federal Aviation Regulations (FAR), which constitute Title 14 of the U.S. Code of Federal Regulations:

Part 91 covers all aviation other than military or commercial. In addition to privately owned and operated single- and multiple-engine propeller craft often thought of as general aviation, it includes private company jets, rotorcraft, gliders, balloons, experimental aircraft, aerial



General aviation aircraft regulated under Part 91 include single-engine, propeller-driven craft (left), but also corporate jets. (© AOPA, all rights reserved.) Air taxis and scheduled commercial flights (upper right) that seat fewer than ten passengers are regulated under Part 135, as are other smaller aircraft used in revenue-producing services. (© NATA, all rights reserved.) Part 121 aircraft include both the familiar large airliners (lower right) and smaller craft that can carry at least ten passengers. (Photo courtesy Southwest Airlines.)



application flying (e.g., agricultural aviation), and instructional flying.

Part 121 includes the major passenger airlines and cargo carriers that fly large transport-category aircraft in revenue service. In March 1997, the definition of Part 121 was changed to include all passenger aircraft operated in scheduled revenue service with ten or more seats. Since 1997, therefore, most carriers that are popularly known as commuter airlines are included in Part 121.

Part 135 includes scheduled passenger service in aircraft with fewer than ten seats and nonscheduled operations. The nonscheduled operations refer to revenue-earning flights in which the departure time, departure location, and arrival location are specifically negotiated with the customer or the customer's representative. All cargo flights that come under Part 135 are in the nonscheduled subcategory, as are air taxi services. Private carriage operations with a passenger-seat configuration of 20 seats or fewer and a payload capacity of 6,000 pounds or less come under the nonscheduled Part 135 operations, as do cargo operations in aircraft having a payload capacity of 7,500 pounds or less.

The NTSB reports annual data for Part 121 and the two categories (scheduled and nonscheduled) of Part 135 in the *Annual Review of Aircraft Accident Data for U.S. Air*

Carrier Operations. The data for Part 91 are published as a separate series, the *Annual Review of Aircraft Accident Data for U.S. General Aviation*.

Assessment Strategy and Assumptions

For this assessment, OFCM staff obtained NTSB annual accident data for three aviation categories corresponding to Parts 91, 121, and 135. One element of general strategy was to follow FAA practice in working with the data where possible, except where a different approach helps to discern trends or patterns useful in understanding the impact of weather hazards on aviation categories. Another general element, already noted, was to apply the 80 percent reduction goal for 2007 to various subcategories and divisions as a benchmark for assessing weather-related accident trends. These two strategic elements led to the following assumptions.

Separation of Part 121 and Part 135 Aircraft Categories. The FAA combines accident data for Part 121 and the scheduled portion of Part 135 in the data analysis for its first objective (fatal carrier accident rate) and in the commercial portion of the data for its third objective. In effect, the FAA's working definition of "U.S. commercial air carrier" is Part 121 and scheduled Part 135. For

several reasons, this report analyzes the Part 121 and scheduled Part 135 data separately (with scheduled Part 135 included with nonscheduled Part 135).

- ▶ The analysis of NTSB data showed considerable differences between Part 135 and Part 121 in trends for weather-related accidents.
- ▶ Over half of the scheduled Part 135 carriers are licensed for operation in Alaska (NTSB 2002b, p. 25). The weather factors affecting smaller aircraft in Alaskan airspace represent a special case, with special challenges (NRC 1995, Appendix I). Lumping scheduled Part 135 accidents with Part 121 accidents, particularly when focusing on weather factors, would lose important distinctions.
- ▶ The available NTSB data on specific weather factors cited in accidents did not distinguish between nonscheduled and scheduled Part 135.

For these reasons, Part 121 data and Part 135 data are maintained as separate aircraft categories throughout this assessment.

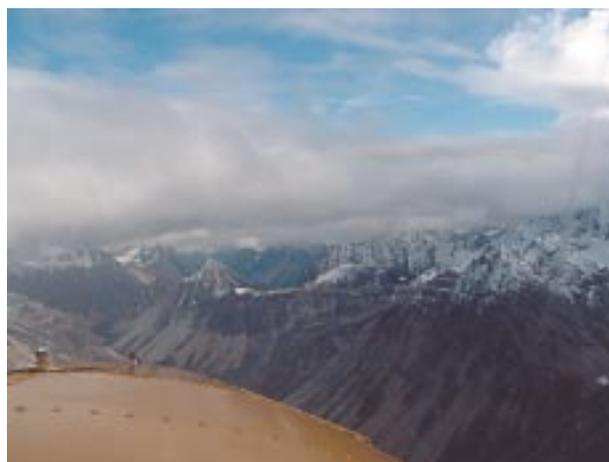
Denominator for Computing Accident Rates. Prior to 2001, the FAA used flight-hours as the denominator for computing an accident rate (e.g., accidents per 100,000 flight-hours) for both commercial air carriers and general aviation. Starting with the FAA's 2001 strategic plan, the denominator for commercial air carrier accident rates was changed to departures (accidents per 100,000 departures). The reason given was that "accidents per departure is a more accurate reflection of commercial passenger risk" (FAA 2001b, p. 5). To conform with the FAA's new practice, this report uses accidents per 100,000 departures as the rate statistic for Part 121. Estimates of annual departures were not available for all of Part 135 or for Part 91, so this report uses accidents per 100,000 flight-hours as the rate statistic for those aircraft categories. (The FAA still uses this rate statistic for its general aviation category, which includes Part 91 and nonscheduled Part 135.)

Base for 80 Percent Reduction Goal Computation. To set the 2007 goal for its first safety objective, the FAA averaged the "commercial air carrier" accident rates for 1994, 1995, and 1996. Section 2 of this report also uses the average of data from these three years to compute the base rate for 80 percent reduction goals. Because the

latest accident data available in 2007 will be for 2006, this analysis assumes that the reduction goal should be reached in 2006. The reduction goals shown in the figures in Section 2 are 20 percent of the average of the corresponding accident statistic for 1994, 1995, and 1996. They are labeled as 2006 goals, for comparison with trend projections of accident rate data to 2006. For the weather hazard trend analyses in Section 3, 1994 data were not available. Therefore, the 2006 goals in Section 3 are computed at 20 percent of the average of the 1995 and 1996 statistics.

Eighty Percent Reduction Goals for Part 91. The FAA safety improvement goals for general aviation include having no more than 350 fatal accidents per year. The analysis of NTSB Part 91 accident data for this report indicates that *an 80 percent reduction in the weather-related fatal accident rate is within reach*. Furthermore, the *National Aviation Weather Initiatives* report did not restrict the scope of its 80 percent reduction goal to just commercial air carriers. For both reasons, this report assumes an 80 percent reduction goal for Part 91 aviation, calculated on the same base years as the commercial aviation goals for Parts 121 and 135.

Weather-Related Accidents. The NTSB database identifies accidents in which weather is considered a factor, without distinguishing between weather as the principal cause or as a contributing factor. For this assessment, all accidents in which weather was identified as a factor are considered to be weather-related.



Flying over Merrill Pass, Alaska. Mountainous terrain is extremely beautiful, but weather can also make it extremely dangerous. Photo courtesy FAA Capstone program.